Thermal Conductivity

Material	Thermal conductivity (cal/sec)/(cm^2 C/cm)	Thermal conductivity (W/m K)*
Silver	1.01	406.0
Copper	0.99	385.0
Brass	...	109.0
Aluminum	0.50	205.0
Iron	0.163	...
Steel	...	50.2
Lead	0.083	34.7
Mercury	...	8.3
Ice	0.005	1.6
Glass,ordinary	0.0025	0.8
Concrete	0.002	0.8
Water at 20 C	0.0014	...
Asbestos	0.0004	...
Hydrogen at 0 C	0.0004	0.14
Helium at 0 C	0.0003	0.14
Oxygen	...	0.023
Snow (dry)	0.00026	...
Fiberglass	0.00015	0.04
Brick,insulating	...	0.15
Brick, red	...	0.6
Cork board	0.00011	0.04
Wool felt	0.0001	0.04
Rock wool	...	0.04
Styrofoam	...	0.01
Wood	0.0001	0.12-0.04
Air at 0 C	0.000057	0.024

*From Young, Hugh D., University Physics, 7th Ed. Table 15-5.

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Wiedemann-Franz Ratio

The ratio between thermal and electrical conductivities of metals can be expressed in terms of the ratio:

$$L = \frac{\kappa}{\sigma T} = \frac{\pi^2 k^2}{3e^2} = 2.45 \, x \, 10^{-8} W\Omega / K^2$$

which may be called the Wiedemann-Franz Ratio or the Lorenz constant.

Metal	$\kappa/\sigma T$ ($10^{-8} W\Omega/K^2$)
Cu	2.23
Ag	2.31
Au	2.35
Zn	2.31
Cd	2.42
Sn	2.52
Mo	2.61
Pb	2.47
Pt	2.51

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Thermal Conductivity

Thermal conductivity is defined by

$$k \equiv \rho c_P \kappa,$$

where c_P is the heat capacity and κ is the thermal diffusivity. In cgs, thermal conductivity is measured in erg cm^{-1} K^{-1} s^{-1}. For air (in MKS),

$$k_{air} = 0.03 \text{ W m}^{-1} \text{ K}^{-1}.$$

SEE ALSO: Electrical Conductivity, Thermal Diffusivity

Eric W. Weisstein